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ABSTRACT

This paper examines the dynamics of change in scholarly publishing and the impact of technological innovation upon the academic community for which the system of scholarly communication serves as an infrastructure. For the purposes of this discussion, what is of immediate interest is the way the productivity issue frames the possible dimensions of the dynamics of technological innovation, thereby setting a research agenda for the future. From the perspective of academic publishing, the academic community consists of two markets in which "gift" exchanges are governed by contract, that of authors and that of the consumers, the largest of which are academic research libraries. Higher education is both the producer and consumer of scholarly publications. Three new factors define the conditions within which a system of scholarly communication may evolve: (1) the emergence of a global economy in which intellectual property is an important source of wealth; (2) the end of the cold war as a stimulus for national information policy which took the form of federal funding for research; and (3) the cultural diversity of society, and the replacement of a melting pot idea by a transnational culture, which may create new social contexts for education. The remainder of this paper examines issues related to digital documents and academic productivity, and digital documents and the academic community. (AEF)

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Cocktails and Dinner, Michael C. Carlos Museum

Digital Documents and the Future of the Academic Community

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Digital Documents and the Future of the Academic Community [*]

Today the academic community is the subject of an experiment in technological innovation. That experiment is the introduction of digital documents as a new currency for scholarly communication, an innovation which will perhaps replace, or perhaps complement the system of print which has evolved over the past century. What are the long term consequences of this innovation for the conduct of research and teaching, for the library and the campus as organizations and places, and ultimately for our sense of academic community?

This conference on Scholarly Communication and Technology has primarily focused upon one key dimension of this process of innovation, the economics of scholarly publishing. The

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central focus has been on the issue of the cost and availability of information: Will digital modes of publication be more cost effective than print, both for publishers and for libraries? But other questions are implicit as well. We has discussed how readers use on-line journals, and how the journal format itself is evolving in a digital medium: Will digital publications change the form and content of scholarly ideas? Together, these papers investigate the emerging outline of a new marketplace for ideas, one which perhaps will yet be reshaped by new kinds of intellectual property law, but which certainly will include new kinds of pricing, new products, and new ways of using information. These are certainly important economic questions, but if we knew the answers would we know enough to understand the dynamics of change in scholarly publishing, and the impact of technological innovation upon the academic community for which the system of scholarly communication serves as an infrastructure?

One reason this question must be asked is the debate about what economists call "the productivity paradox." This is the observation that the introduction of information technology into the office has not increased the productivity of knowledge workers thus far, unlike the productivity gains which technology has brought to the process of industrial production. Yet Peter Drucker has described the productivity of knowledge workers as the key management problem of the 21st Century.[1] And more recently Walter Wriston has described information as a new kind of capital which will be the key to wealth in the economy of the future, saying: "The pursuit of wealth is now largely the pursuit of information, and the application of information to the means of production."[2] Why, then, has information technology not increased the productivity of knowledge workers? Does it not bring about cultural and organizational changes?

Erik Brynjolfsson has defined three key dimensions within which an explanation for the paradox might be found.[3] First, perhaps this is a problem of measurement, since the outcomes of work mediated by information technology may not fit traditional categories, and are perhaps difficult to measure with traditional methods. Secondly, the productivity paradox might be a consequence of the introduction of very different incentive structures which change the cultures of work, and may require redesign and reorganization of work processes previously based on printed records in order to create productivity gains. And thirdly, perhaps information technology creates new kinds of economic value (such as variety, timeliness and customized service), which change the very nature of the enterprise by introducing new dimensions and qualities of service.

The analysis of the impact of information technology upon scholarly communication has only indirectly been a discussion about productivity thus far, although such a discussion inevitably will begin when it is understood that this will be a discussion about the quality of academic information and work, not just about its efficiency.[4] For the purposes of this discussion, however, what is of immediate interest is the way the productivity issue *frames the possible dimensions of the dynamics of technological innovation*, thereby setting a research agenda for the future. That is: even if digital documents were shown to be more cost effective than printed journals, where might we look to find the consequences of this innovation for the academic community? How might our understanding of the *outcomes* or *impact* of research, teaching and learning change, if at all? How might the *incentives* for academic work evolve, and would the *organization* of the process of research and teaching change? Will new kinds of *value* be introduced into academic work, changing its cultures, and will traditional kinds of value be lost? This is the broader research agenda which provide context for discussion of the price, supply and demand for digital publications.

In sum, how might the substance and organization of academic work change as information technology changes the infrastructure of scholarly communication? To borrow a term from a very different economic tradition, the question of the social impact of information technology concerns the *mode of production*, that is, the complex of social relationships within which academic work is organized, within which the products of academic work are created and consumed, and the cultural valuation given to academic work and its products. In the course of this exploration of the changing modes of production which govern knowledge work it will be necessary to think seriously about whether printed knowledge and digital information are used in the same way, if we are to understand the nature of demand; about the new economic roles of knowledge, if we are to understand issues of price and supply; and about how the management of knowledge might be a strategy for increasing the productivity of knowledge workers.

The system of scholarly communication

The idea that there is a system of scholarly communication was popularized by the ACLS newsletter **Scholarly Communication**, which published a survey on the impact of personal computers upon humanities research in 1985. It is a term invented to frame both print publication and digital communication within a single functional perspective, tacitly asserting a continuity between them. It is this continuity which is in question, not least because the term "scholarly communication" encompasses the very research processes which are being transformed by information technology, creating new kinds of information products and services which were not previously part of the scholarly publishing marketplace. These include, for example, patents on methodological procedures and genetic information; software for gathering, visualizing and analyzing data; information services, such as document delivery and databases; network services; Lists and Web pages; electronic journals and CD-ROM.

Today each of the parts of the system of scholarly communications built over the past fifty years are changing, and it is unlikely that a new equilibrium will resemble the old. This system is unusual, perhaps, in that different participants perceive it from very different, perhaps contradictory, perspectives. From the perspective of the academic community, both the production and consumption of scholarly information are part of a culture of gift exchange. In gift cultures, information is exchanged primarily (although not necessarily exclusively) in order to create and sustain a sense of community greater than the fragmenting force of specialization and self interest. From the perspective of academic publishing, the academic community consists of two markets in which exchanges are governed by contract, that of authors and that of the consumers, the largest of which are academic research libraries. It is this perspectivism, perhaps, which leads each side to hope that digital documents will replace printed journals without changing other aspects of the system of scholarly communication.

Gift and market exchange are symbiotic, not opposites. If scholarly publishing is governed by the rules of market exchange, it must manage the boundaries between two gift cultures, that within which knowledge is created, and that within which knowledge is consumed. The crisis of scholarly communication has made these boundaries very difficult to manage, as ideas from the University are turned into intellectual property, then sold back to the University to be used as a common good in the library.

Why the crisis in boundary management? The immediate crisis which has destabilized the system is the problem of sharply increasing costs for scholarly information. The causes of the

crisis are varied, but begin with the commercialization of scholarly publishing, the dramatic shift from nonprofit to nonprofit publishing since the 1950's, creating the hybrid gift/market system described above. In turn, the historic growth in the amount of scientific, technical and medical information, driven by federal funding, has increased costs. And the waning of a sense of the legitimacy of library collection costs within the University has allowed the rate of growth of collection budgets to fall far below the rate of price increases.[5] Even with cost/price increases, the gift economy still subsidizes the market economy, and remarkably those who subsidize research do not yet make an intellectual property claim for the copyrighted intellectual property they support. Subsidies include, for example, the federal funding of research, institutional subsidies, and the voluntary labor of faculty providing editorial services to publishers.

This system evolved at the turn of the 20th Century as a subsidy for non-profit University presses and disciplinary society publishers, in order to circulate scholarly information and build a national intellectual infrastructure. Since 1950, however, federal research funding and commercial publishing have reshaped the system, creating a hybrid market-gift exchange system with many unrecognized cross subsidies.

Higher education is both the producer and consumer of scholarly publications. As creators of scholarship, faculty are motivated by non-market incentives, primarily promotion and tenure; yet at the same time, faculty see themselves as independent entrepreneurs, managing a professional career in self governed disciplines and educational institutions. This guild-like structure is a deliberate anachronism, perhaps, but one which sustains a sense of professional identity through moral as well as material rewards.

Scholarly publications are consumed within a gift culture institution called the library, a subsidized public good within which knowledge appears to the reader as a free good. This gift culture is, in turn, subsidized by the owners of intellectual property through the Fair Use and First Sale doctrines, which generally allow copyrighted information to be consumed for educational purposes.

The ambiguity at the boundary of gift and market extends to institutions of higher education as well, which are simultaneously corporation and community. But the dominant factor which has shaped the last fifty years is that Universities have become a kind of public interest corporation serving national policy goals. Modern research Universities have been shaped by federal research funding since the Sputnik crisis, as "milieux of innovation" to function as tacit national laboratories for a polity uncomfortable with the idea of a formal industrial policy.[6]

This system of scholarly communication is in an irreversible process of change. Consider, for example, the possible consequences for this system if some of the ideas and questions being debated nationally were to come to pass:

- What is the future of University research? Do research Universities still play a central role as national milieux for innovation, or has the corporation become the focus of innovative research and national information policy?

- What is the future scope of higher education? Historically Colleges and Universities have had a tacit monopoly of the education market, based upon accreditation and geographical proximity, but instructional technology and distance education have created new markets

for education. With the Western Governor's University proposal a national market for education would be created, based on selling teaching services and evaluated by examination, which in principle could compete with the traditional institutional settings for education.

- What is the future of the Library as a public good? In the polity, the idea of a national digital library has been modeled upon the universal access policies governing telephone and electric utilities. Here the public good is fulfilled by the provision of "access," but it will be the consumer's responsibility to pay for information used.

- What is the future of Fair Use? Rights which exist in print are not being automatically extended to the use of digital works. Federal policy discussions about intellectual property in the digital environment have not included Fair Use, giving priority to the creation of a robust market in digital publication and the creation of incentives for the publication of educational works.

These are questions, not predictions, but they are questions which are being discussed in the polity, so they are not mere speculation. They are intended only to point out that the system of scholarly communication is a historical creation which was a response to certain conditions which may longer exist.

Three new factors define the conditions within which a system of scholarly communication may evolve. First is the emergence of a global economy in which intellectual property is an important source of wealth, thus the value of scholarly research may be a matter of economic interest extending far beyond the traditional concerns of the academy. Secondly, the end of the cold war as a stimulus for national information policy which took the form of federal patronage of University research may fundamentally change the shape and content of federal funding for research. And thirdly, the astonishing cultural diversity of our society, and the replacement of a melting pot ideal by a transnational culture (in which family, ethnic, corporate and professional loyalties may cross and transcend national boundaries), may create entirely new social contexts for education. For example, outside of the sciences, scholarly disciplines have tended to have national scope, but are likely to develop international paradigms and concerns.

Digital documents and academic productivity

What is the nature of digital documents as an innovation, that it is possible to ask whether they might affect the value of information and its use, and the organization of academic research? Geoffrey Nunberg has identified two differences between digital and mechanical technologies which affect both the value of knowledge and the organization of its reproduction.[7]

> ... unlike mechanical antecedents like the printing press, the typewriter, or the telegraph, the computer isn't restricted to a single role in production and diffusion. In fact, the technology tends to erase distinctions between the separate processes of creation, reproduction and distribution that characterize the classical industrial model of print commodities, not just because the electronic technology employed is the same at each stage, but because control over the processes can be exercised at any point. ...The second

> important difference between the two technologies follows from the immateriality of electronic representations and the resulting reductions in the cost of reproduction.

The fundamental consequence of these differences, Nunberg argues, is that the user[**] has much greater control of the process of digital reproduction of knowledge as well as its content, essentially transforming the meaning of the word publication by allowing for individual customization of knowledge.

However, these differences in the process of the reproduction of ideas do not apply to every electronic document, only to true "digital documents."[8] Today's marketplace consists largely of *digitized* documents, that is, works written for and reproduced in printed journals, then scanned and distributed on the network. Digitized documents conform to the modes of production of print journals: to the rhetorical rules of the genre of scientific and to the traditional relationships between author, publisher and reader. If prior examples of technological innovation hold in this case, however, digitized documents represent only a transitional stage, one in which the attempt is made to focus the use of new technologies upon increasing the productivity of traditional modes of production and to reinforce traditional authority patterns and economic interests. CD-ROM technology is a good example of the attempt to preserve the traditional modes of production, yet take advantage of the capability of digital signals to include multimedia, by packaging them within a physical medium which behaves just like a printed commodity. The immateriality of networked information is much more difficult to control, although encryption and digital watermarking are an attempt to transform digital signals into commodity by giving an electronic signal some of the characteristics which regulate physical commodities.

The interesting points to watch will be to see if the content of digital and print versions of the same works begin to diverge, and whether readers will begin to be allowed to appropriate published works and reuse them in new contexts. Markets are made by consumers, not by publishers, and the fundamental question concerns the future of reader's behavior as the consumers of information. For example, what will be the unit of knowledge: Will readers want to consume digital journals by subscription? Or consume single articles and pay for them as stand alone commodities through document delivery? Or treat a journal run as a database and pay for access to it as a searchable information service? As Nunberg points out, the intersection of technology and markets will be determined by the nature of the digital signal, which unifies the processes of production, reproduction and use of information.

In thinking about the nature of digital documents and the kind of social relationships which they make possible, consider the impact of what may well be the most successful digital document thus far, the credit card. The credit card itself is only an interface to liquid cash and credit, taking advantage of mainframe computer technology and computer networks to manage market transactions wherever they occur around the world. It replaces printed currency, and portable forms of wealth such as letters of credit and traveler's checks, with a utility service. It creates new kinds of value: liquidity, through an interface to a world wide financial system; timeliness and access, through twenty-four hour service anywhere in the world; and customized or personalized service, through credit. These new kinds of value are not easily measured by traditional measures of productivity; Brynjolfsson notes that by traditional measures the ATM seems to reduce productivity, by reducing the use of checks, the traditional output measure of banks. Yet it is not a sufficient description of the value of credit or debit cards to characterize the new kinds of value simply as improvements in the quality of service, since they have created entirely new kinds of markets for financial services and a new interface for economic activity

which supports new more mobile life styles.

One of these new markets is worthy of a second look, not only as an example of innovation, but to explore the *reflexive* quality of digital documents. When I use a debit card, a profile of my patterns of consumption is created, information which is of economic value for advertising and marketing; thus coupons for new or competing products appear on the back of my receipt. Information about my use of information is a new kind of economic value, and the basis of a new kind of market when used by advertisers and market analysts. In tracking the use of digital services, network technologies might also be described as keeping the consumer under surveillance. Issues of privacy aside, and they are not sufficiency recognized as yet, this will make possible an entirely new, direct, and unmediated relationship between consumer and publisher.

Thus the discussion of protecting intellectual property on the Internet has focused not only on technologies which allow for the control of access to copyrighted material, but also on technologies which audit the use of information, including requirements for the authentication of the identity of the user and tracking patterns of use. The consequences of this reflexivity may well reflect a fundamental shift in the way in which we conceive of the value of information. While markets for physical commodities were regulated by laws and inventory management techniques, markets for digital services will focus both upon the content and use of information, and will use the network as a medium for knowledge management techniques.[9]

To summarize this process of innovation: credit cards might be described in productivity terms as an efficient new way to manage money, but they might also be described as creating entirely new genres of wealth, literally a new kind of currency; as new ways of life which create new kinds of social and geographical mobility; and in terms of the new kinds of markets and organizations which they make possible. Digitized documents may lower the costs of reproduction and distribution of print journals, and perhaps some first copy costs, but they also create new kinds of value in faster modes of access to information, new techniques for searching, and more customized content. And in the longer run, true digital documents will produce new genres of scholarly discourse, new kinds of information markets, and perhaps new kinds of educational institutions to use them.

At the moment these new possibilities tend to be discussed in terms of the capacity of the new technology to disrupt the laws, cultures and organizations which have managed research, reading, publishing and intellectual property in the era of print. Most prominent among these has been the discussion of the protection of copy-right on the Internet, but there is also active concern about the social impacts of digital documents. There is the problem of privacy and surveillance on the Internet, particularly in the workplace. Pornography on the Web has been defined as a social problem involving the protection of children, but this is only one example of a broader issue concerning the impact of a global communications medium whose scope transcends even national regulatory authorities upon local norms and culture. And there is interest in the quality of social relationships in Cyberia, manifested negatively in the problem of hostile electronic mail, and manifested positively by emerging forms of virtual community.[10] And there is a debate in national information policy about the proper balance between the public interest in access to information, and the commercialization of information in order to create robust information markets.

Digital documents and academic community

In an essay called "The Social Life of Documents," John Seeley Brown and Paul Duguid have suggested that documents should not be understood solely as containers for content, but as catalysts for the creation of a sense of community. They say: "the circulation of documents first helps make and then helps maintain social communities and institutions in ways that looking at the content alone cannot explain. In offering an alternative to the notion that documents deliver meaning, [there is a] connection between the creation of communities and the creation of meaning."[11] That is, our attention should not be on the artifact itself, nor perhaps is the market the fundamental social formation around documents, but documents and markets create and sustain the social worlds, or communities, of readers. Here we return, at last, to the missing subject of this discussion of the causality of technology and digital documents, the academic community.

More recently, the business management literature has begun to consider an interesting variant of this thesis, that the formation of virtual communities is the most important medium for the creation and sustenance of markets for digital services. For example, John Hagel III and Arthur G. Armstrong argue that producers of digital services must adapt to the communitarian culture of the network, for,

> ...by giving customers the ability to interact with each other as well as with the company itself, businesses can build new and deeper relationships with customers. We believe that commercial success in the on-line arena will belong to those who organize virtual communities to meet multiple social and commercial needs.[12]

While producers controlled traditional markets, they argue, the information revolution shifts the balance of power to the consumer by providing tools to select the best value, creating entirely new modes of competition. The markets of the future will take the form of virtual communities which will be a medium for "direct channels of communication between producers and customers," and which will "threaten the long term viability of traditional intermediaries."[13]

The questions concerning technological innovation might now be reconstituted as a kind of sociology of knowledge: What kind of academic community first created print genres, and was in turn sustained by them? What kind of community is now creating digital genres, and is in turn sustained by them? And what is the relationship between the two, now and in the future?

On a larger scale, the relationship between virtual community and digital documents is a tacit dimension of national information policies. These are the kinds of questions that worries the People's Republic of China about creating a digital library, for the Internet is a medium for political dissent and organization, and the digital library provides access to information which has the potential to transform the scope and nature of political discourse and thereby the form of political authority. In the United States, national information policy has tended to focus on the creation of information markets, but the broader discussion of the social and political impact of digital communications has been concerned with issues of community. For example, the Communications Decency Act and subsequent judicial review has concentrated upon Internet pornography and its impact upon the culture and mores of local communities. Social and political movements ranging from Greenpeace to Militia movements have used the Internet to organize dissent and political action; is this protected free speech? Universities are concerned about the impact of abusive electronic mail upon academic culture. In each case, digital information is changing the nature of culture.

The bridge between technology and community is suggested by the elements in the analysis of productivity: how new technologies add new value, create new incentives, and enable new kinds of organization. Brown and Duguid argue that our nation's sense of political community was created by newspapers, not so much in the content of the stories, but in,

> reaching a significant portion of the population, newspapers helped develop an implicit sense of community among the diverse and scattered populace of the separate colonies and the emerging post-revolutionary nation...That is, the emergence of a common sense of community contributed as much to the formation of nationhood as the rational arguments of Common Sense. Indeed the former helped create the audience for the latter.[14]

Similarly, and closer to the issue of scholarly communication, the scientific letters which circulated among the Fellows of the Royal Society were the prototype for scientific journals, which in turn sustained scholarly disciplines, which are the organizing infrastructure for academic literature and departments. Let us postulate then, for heuristic purposes, that when we speak of added value, we are beginning a discussion of the process of innovation which is linked to an understanding of community formation. New forms of value, which is to say new forms for the *use* of information, create new genres of documents, which in turn create a literature, which serves as the catalyst and historical memory for new forms of communities.

In the case of print and digital documents, change is not evolutionary because these two kinds of information offer different kinds of value, but neither are they opposites. Genre, for example, has been shaped by the physical characteristics of the print medium, including the *design* of information (e.g., page layout, font), as well as the rhetorical norms governing the structure of information (e.g., essay, scientific article, novel). Rhetoric has been described as a strategy for managing the allocation of the scarcest resource of modern times, our attention. Although we often complain of "information overload," this may well reflect an early stage in the development of rhetorical structures for modern media. Certainly there is more information, and more kinds of information, but the real problem is the difficulty in determining the quality of digital information (e.g., the lack of reputation and branding); the difficulty of knowing which kind of information is relevant for certain kinds of decisions (e.g., the problem of productivity); and the relatively primitive rhetorical rules which govern new media (e.g., the problem of flaming in electronic mail).

Consider, for example, the technology of scientific visualization and multimedia. Thus far, visual culture has been governed largely by the rhetorical rules of entertainment, which require us to surrender our critical judgment in order to enjoy the show. Thus the problem of the quality of multimedia information is not simply technical, but requires the development of new genres and rhetorical norms within which visual media are consistent with academic values such as critical judgment.

Or, consider some of the new genres for digital documents, which might well be described as adding new kinds of value to information: hypertext, the Boolean search, and the database. The database raises new questions about the unit of knowledge, as we have seen. Will consumers subscribe to and read the digital *journal*, pay for network delivery of digital *articles*, or will the unit of knowledge be the *screen*, the digital analog of the paragraph, which is identified by a search engine or agent? HTML raises the question: who is responsible for the context of information, the author or the reader? If one can jump from text to text, linking things which had not previously been linked, it is the reader who creates context and therefore

governs meaning, and reading becomes a kind of performing art.

These questions might be described, perhaps, as a legitimation crisis, in that the traditional authorities which governed or mediated the structure and quality of print are no longer authoritative: the author, the editor, the publisher and the library. Who are the new authorities?

Sociologically, there is no doubt that the information problems of engineers and scientists were the template from which new genres and rhetorical forms evolved, becoming instantiated into hardware and software, thence into computer literacy, and thence the user skills and modes of reading or using information. Hypertext, for example, turns narrative into a database, which is a highly functional strategy for recovering specific bits of information in scientific research, as, for example, in searching for information with which to solve a problem. Electronic mail is a highly efficient means for exchanging messages but has little scope for lexical or rhetorical nuance. This is not a problem for groups sharing a common culture and background, like scientists and engineers, but it becomes a problem given the diverse social groups which use electronic mail as a medium for communication today, hence the frequency of flaming and misunderstanding.

As sociologists like Bruno Latour have noted, in any case, the original intent of the designers of a technology does not necessarily govern the process of technological innovation, for the meaning and purpose of a technology mutates as it crosses social contexts.[15] Thus the problem is not best posed in terms of the cultural hegemony of the sciences and technology over academic institutions, but these origins can still be recognized when we give "commands" to a computer.

But there is an interesting problem to be thought about, namely the cultural and organizational consequences of information technologies which originated in other sectors of the economy, from business and the military, for the academic community. Thus far the discussion of this topic has occurred at the boundary of the academic enterprise, often in the context of thinking about the uses of distance education, which is to say, the extension of the scope of a given institution's teaching services to a national, or perhaps global, market. But there is a broader question about the nature of the academic community itself in a research University: what is the substance of this sense of community, and what sustains it?

While it is often claimed that digital communication can sustain a sense of *virtual* community, what is meant by virtual, and what is meant by community? The literature on *social capital* argues that civic virtue is a function of participation, and those who participate in one voluntary social activity are highly likely to participate in others, creating a social resource called civil society or community.[16] Robert Putnam argues that television, and perhaps other media, are a passive sort of participation which replace and diminish civic communities. The question is whether today's virtual communities represent a kind of social withdrawal, or whether they might come to be resources for social participation and community. If this is an important goal of digital networks, how can they be designed to this purpose. Can networks be designed to facilitate the moral virtues of community, such as trust, reciprocity, and loyalty?

And finally, to return to the question of the productivity of knowledge workers in an information society, and mindful of the heuristic principle that documents can be understood in terms of the communities they sustain, is not the research library best conceptualized as the traditional knowledge management strategy of the academic community? If so, how well does the digital library perform this function, at least as we understand it thus far? Other than the

parking lot, perhaps, the Library is one of the last public or common goods in an academic world which is increasingly specialized, and perhaps fragmented. The digital library, however, is generally conceived of only as an information resource, as if the Library were only the container for a collection, rather than a shared intellectual resource and site for a community.

The social functions of the Library are not easily measured in terms of outcomes, but are an element in the productivity of faculty and students. To some extent, perhaps, libraries have brought this problem on themselves by measuring their quality in terms of fiscal inputs and size of collections, and must begin to define and measure their role in productivity and community formation. But in another sense, the focus upon the content and format of information to the exclusion of consideration of the social contexts and functions of knowledge is a distortion of the nature and dynamics of scholarly communication and the academic community.

NOTES:

* This paper is the written version of an after dinner speech at the conference on Scholarly Communication and Technology, presented on April 24, 1997.

1. Peter F. Drucker, **The Age of Discontinuity** (New York: Harper and Row, 1978)

2. Walter Wriston, **The Twilight of Sovereignty** (New York: Charles Scribner's Sons, 1992), xii.

3. Erik Brynjolfsson, "The Productivity Paradox of Information Technology: Review and Assessment." **Communications of the ACM** (December, 1993), 36(12)67-77.

4. See, for example, William F. Massy and Robert Zemsky, "Using Information Technology to Enhance Academic Productivity," a White Paper for the EDUCOM National Learning Infrastructure Initiative (NLII), 1995.

5. Anthony M. Cummings, Marcia L. Witte, William G. Bowen, Laura O. Lazarus, and Richard H. Ekman. **University Libraries and Scholarly Communication**. Washington DC: The Association of Research Libraries, 1992.

6. See Manuel Castells, **The Rise of the Network Society** (London: Blackwell Publishers, 1996) 56.

7. Geoffrey Nunberg, "The Places of Books in the Age of Electronic Reproduction," **Future Libraries**. R. Howard Bloch and Carla Hesse, editors. (Berkeley: University of California Press, 1993) 21-22.

** The term "user" is applied to the consumption of digital documents, the way the term "reader" is applied to the consumption of printed works. "User" is a kind of semantic strategy

for pointing out that engagement with a technology mediates between the reader and the text, allowing for the direct control over content and format which Nunberg describes.

8. See, for example, the report on a workshop held at the Hawaii International Conference on System Sciences conference in January 1995, edited by M. Stuart Lynn and Ralph H. Sprague, Jr.: Documents in the Digital Culture: Shaping the Future. Honolulu, Hawaii: A HICSS Monograph, 1995.

9. On knowledge management, see, for example: Thomas H. Davenport, Sirkka L. Jarvenpaa and Michael C. Beers, "Improving Knowledge Work Processes," **Sloan Management Review** (Summer 1996), 53-65.

10. The term Cyberia reflects the anthropologist's approach to analyzing the Internet as a site for culture and community, best summarized by Arturo Escobar, "Welcome to Cyberia: Notes on the Anthropology of Cyberculture." **Current Anthropology** (June 1994), 35(4)211-231.

11. John Seeley Brown and Paul Duguid, "The Social Life of Documents," **Release 1.0: Esther Dyson's Monthly Report.** (New York: Edventure Holdings Inc., October 11, 1995) 7.

12. John Hagel III and Arthur G. Armstrong, **net.gain: expanding markets through virtual communities**. (Boston: Massachusetts: Harvard Business School Press, 1997)5.

13. **Ibid**., 204

14. Brown and Duguid, **op.cit.,** 5. This argument is derived from Benedict Anderson's **Imagined Communities.**

15. Bruno Latour, **Aramis, or The Love of Technology.** Translated by Catherine Porter. (Cambridge, Mass: Harvard University Press, 1996). Note that Latour chose the novel genre to discuss this phenomenon.

16. See, for example: Robert D. Putnam, "The Strange Disappearance of Civic America," **The American Prospect** (Winter 1996), 24(34-48). In the same issue, see also: Sherry Turkle, "Virtuality and Its Discontents: Searching for Community in Cyberspace."

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